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Railway Economics in Rhodesia

J. H. West

Mr. J. H. West is the Deputy-Secretary in the Ministry of Transport and Power.

RAILWAY ECONOMICS IN RHODESIA[1]

J. H. WEST

HISTORY

Until the 19th century land transport was almost entirely dependant on the horse. It was expensive and therefore confined to passengers and high value goods which could stand the cost. With the industrial revolution came a great demand for coal to provide power for the new factories. But the existing roads were unsuitable for heavy loads and colliery owners therefore started building their own roads consisting of double strips of stones spaced to take the wheels of a horse drawn cart. Wood was sometimes used but it tended to rot and was gradually superceded by iron plates, cast iron strips and ultimately wrought iron rails. The extra cost of the iron roads was offset by making them thin and putting flanges on the wheels of the vehicles. Pulling several vehicles in a train spread the cost over a greater load and this was made possible by the reduction in friction due to the special track.

But to obtain greater efficiency it was necessary to employ some traction power much greater and faster than a team of horses. Steam locomotives were gradually introduced but were not too successful because the boilers did not produce enough steam and because it was universally believed that they must have cogged wheels and track. In 1814 the daring innovation of smooth wheels was introduced and a little later Stevenson discovered that a good head of steam could be maintained if the exhaust from the cylinders was led into the furnace and out through the funnel. The turning point was reached in 1825 when Stevenson's Rocket pulled a train of one coach and 33 wagons from Darlington to Stockton at twelve miles an hour.

Whilst the early tracks were laid on the public highways it was soon realised that separate routes were needed with smoother curves, smaller gradients and shorter distances. Like the canals and roads these early railroads were open to anyone to use and it took some decades for the modern principle of the owner being the sole operator, to develop. Once this principle was adopted the real advantages of railways—regular traffics, through hauls, full truck loads, minimum handling and therefore cheap transport—became manifest.

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1 Paper read to the Society at a joint meeting with the Institute of Transport in February, 1968.

CAPITAL

Because of the need for a specialised track the railways are large users of capital. The Rhodesia Railways, for example, owns fixed assets valued at £83 million ("fixed" assets include rolling stock). This is not quite as large as the Central African Power Corporation's investment in the Kariba system and much less than the total investment in electricity supply in Rhodesia and Zambia. Apart from electricity and possibly the Zambian copper mining complex it is fairly certain that no other industry in this part of the world is as highly capitalised as the Railways. In most other countries the situation is similar. Thus in South Africa expenditure on railway fixed assets to date exceeds £600 million and in Britain the book value of railway fixed assets is £1,720 million. The £83 million of railway investment in Rhodesia and Zambia may be compared with Central African Airways' total investment of only £1.5 million or the total expenditure to date from Loan Vote by the Rhodesia Government of £21 million on roads and bridges.

Not only is the capital large in absolute terms, it is also large in relation to revenue earned. The Rhodesia Railways fixed assets of £83 million, for example, compare with an income in 1965/66 of £37 million from sales of transport services. In other words, well over £2 of investment is needed for every £1 of annual sales.

It is sometimes said that railways are prejudiced because they have to bear the costs of the track, marshalling yards, stations, goods depots, signalling and other equipment tied to the ground, whereas airways, road vehicles and ships are not similarly burdened. There has frequently been public controversy as to whether road transport in particular is sufficiently taxed to offset this initial advantage. Perhaps the best approach is to avoid the arguments and consider the other side of the coin. As Beeching[2] says ". . . the benefits which can be derived from possession of this high cost route system are very great. First, it permits the running of high capacity trains which themselves have very low movement costs per unit carried. Second, it permits dense flows of traffic and provided the flows are dense, the fixed costs per unit moved are also low. Third, it permits safe and reliable scheduled movements at high speeds. In a rationalised system of transport we should therefore expect to find railways concentrating upon those parts of the total traffic pattern which enable them to derive maximum benefit from these three advantages which they have, as the counterpart to their unavoidable burden of high system costs." As an illustration of what can be done in this direction a famous example is a tacomite mine in U.S.A. which owns a railway running six trains a day, each with 110 wagons

2 Dr. R. Beeching, in a speech to the Institute of Directors, London, 1962.

containing 85 tons. The daily movement is 2.6 million ton-miles. The Rhodesia Railways cannot match this spectacular feat but they do run an enormous quantity of goods over their 2,700 miles of track. In the year 1965/66 they carried 16 million tons of goods and 4 million passengers. On the average each wagon performed 1,200 ton-miles per day, a figure which only the largest road vehicles can emulate. The average train contained 380 tons of goods involving a direct labour complement of only three, a driver, a fireman and a guard.

COSTS

Because of high capital costs a large proportion of the annual costs of operating a railway consists of interest and redemption on borrowed funds, hire purchase repayments and depreciation. In the case of the Rhodesia Railways these items in 1965/66 amounted to 20% of total costs. These costs are of a fixed nature and once the capital has been sunk the associated annual charges have to be met whatever the volume of traffic. Some of these costs can be attributed to particular traffics, for example refrigerator cars, tank cars and passenger coaches, which can only be used for specific purposes. But the great bulk of such costs cannot be associated with a particular category of traffic, and much less with a category on a particular route. They are strictly "overheads".

Another large cost item is renewal of permanent way. Track is constantly wearing out and has to be replaced. A track which is wearing out may be replaced by a similar track or it may be realigned or reconstructed to take more traffic. In the former case the whole cost is charged as an operating expense whereas in the latter the extra cost of improving the line is normally capitalised. In the case of the Rhodesia Railways there is a 15 year renewal programme, the actual cost of renewals being charged against a fund so that the debit to working account can be more or less stabilised from year to year. Like capital charges the cost of track renewals cannot be attributed to particular traffics and so forms another "overhead".

Although they are highly capitalised, railways are also big employers of labour. The Rhodesia Railways, for example, has a total complement of 30,000 people embracing a wide variety of skills, and making it the biggest employer, apart from the combined Governments, of the three countries served. The annual bill for salaries and wages comes to £22 million but not all of this is an operating cost. Indeed a large part covers maintenance of track, locomotives, rolling stock and fixed installations as well as the creation of capital assets, particularly buildings. Another large part of the bill covers administrative operations such as management, accounting, computing, stores, engineering, personnel, planning etc., which cannot be attributed to any particular traffic but which continue to increase with the

overall increase in traffics. It is hard to find many examples of salaries and wages which are specific to a particular category of traffic. Even the engine driver's wages are normally related to a wide range of traffics though they are calculable as a direct cost of any particular route.

Coal, diesel oil and water are analogous to crew wages in that they are capable of assessment as far as any particular route is concerned but cannot be ascribed to particular traffics.

The general picture therefore is that railway costs cannot usually be linked to particular traffics and that only a relatively small part of total costs can be regarded as direct costs of operations. By far the largest proportion are overheads which have to be met from revenue as a whole but it is quite impossible to say that such and such a traffic ought to make such and such a contribution to overheads. For the Rhodesia Railways in 1965/66 the heading "Operating and Running Costs", which includes crews, maintenance, fuels, servicing depreciation and hire of all rolling stock represented only 35% of total cost.

TARIFFS

Since the costs of carrying any particular commodity are unknown it is not possible to base rates on costs. All over the world therefore railways have adopted a policy of charging what the traffic can bear. Some traffics move at tariff rates which do no more than cover the bare cost of movement. Others pay rates which leave a big profit. This policy involves massive cross subsidisation between traffics but if properly applied it produces the maximum total traffic and therefore—in theory if not always in practice—spreads the overheads on average as thinly as possible.

The difference between the highest and lowest rates is sometimes quite remarkable. In many European countries the highest may be only three times the lowest. In South Africa the highest rates are about ten times the lowest. In Rhodesia, taking 300 miles as the standard Tariff No. 1 works out at 10.3d. per ton-mile whereas the Special Mineral Scale is only 0.7d. Between these two rates there are thirteen rates for goods, and in addition there are special rates for livestock, motor vehicles, liquids carried in bulk, and the four passenger scales.

Determining what rate a particular commodity can bear is bound to be something of an arbitrary matter but eventually the allocation of a commodity to a particular rate tends to become hallowed with time. The very first public railway established by an Act of Parliament in 1801 set the precedent for all its successors though it was itself influenced by the pattern of rates charged by the canal operators. This was the Surrey Iron Railway which ran between Croydon and Wandsworth. Its tariff contained only 27 items grouped into four scales. The lowest was 2d. per ton-mile and included dung

among other items. The next rate was 3d. per ton-mile for limestone, brick, etc., then 4d. per ton-mile for tin, potatoes etc., and finally 6d. per ton-mile for "all other goods".

The Rhodesia Railways tariff book today lists about 2,400 items, though many are included more than once. There are four main reasons why the same commodity may move at different rates. First, there is a general policy of encouraging exports, so, for example, sugar for export moves at a lower rate than sugar for local consumption. Second, a commodity may vary considerably in quality so that the high value part is really a different item from the low value part. An example is asbestos which moves at three different rates depending on whether it is valued at under £25 per ton, £25 to £50 per ton or over £50. Third, there is a preference for goods consumed by local industry. An example is cotton yarn which has a very favourable rate if it is moving to a factory for manufacturing purposes. Fourth, there is a discount for quantity and this applies to a large number of commodities. The reduction in rate may be concerned purely with different quantities, for example maize in bags moves much cheaper in full truck loads than in small quantities. Or it may be concerned with different methods of packing. For example, coal in bags is much more expensive to move than loose coal in big quantities.

Tariffs No. 1 to 10 are basically for relatively small consignments, that is those which do not fill a truck. To some extent this is a reflection of costs of movement because it costs the same to move a full truck as a half empty one. But it is hard to pretend that cost of movement (even if it could be calculated) has any great influence on the allocation of commodities to rates. Thus glass bottles move at Tariff 10 which is 3.1d. per ton-mile for a 300 mile journey, whereas plastic bottles move at Tariff 1 which is 10.3d. Tariffs Nos. 11 to 14 and the Special Mineral Scale are for goods moved in bulk and a greater quantity of goods, including the whole of the export minerals, coal and maize, move on these rates than on Tariffs 1 to 10. "What the traffic can bear" is a difficult criterion and it is not easy to explain some of the groupings. Comparatively high value commodities such as maize and wheat, for instance, moves at the same rate as earth and lime. Sugar, which at the moment sells for less than maize, moves at a higher rate. Cider moves at a higher rate than beer. Gravestones move at the same rate as rectified spirit. There are of course other factors which are taken into account before deciding the tariff to which a commodity should be alloted. These include risk, packing, cost of handling and weight in proportion to bulk, in addition to factors already mentioned. Although it may not always be possible to produce convincing reasons why a particular item is classified in a particular way, the Harragin Commission which was set up

in 1958 to report on tariffs, "found no widespread desire for any fundamental change in the basic principles of the rates structure established in Rhodesia".[3]

The one systematic concession to the principle of cost of service as opposed to ability to pay is in relation to terminal charges. It is clear that before any commodity actually moves, the Railways incur certain costs and there are similar costs after actual rail movement is completed. These are called terminal costs and include the provision of sidings, sheds, warehouses, marshalling yards, loading, unloading, sheeting, parcel handling, tickets, porters, checking and clerical services etc. They amounted to 14% of total costs in 1965/66. Strictly speaking there should be an addition to each tariff to cover these costs irrespective of mileage, but in fact the method adopted is to include first a basic charge which is supposed to represent the direct terminal costs and then to spread the balance of such costs over the first 250 miles of each journey. The result of these two additions is to introduce a taper in each tariff the extent of which is appreciable, as illustrated in the following table.

Rates for Different Distances
(In Pence per Ton-Mile)

Tariff	50 miles	300 miles	600 miles
No. 1	21.6	10.3	7.5
2	19.7	8.5	6.2
3	17.8	7.1	5.1
4	14.9	6.4	4.5
5	14.4	5.6	3.9
6	13.9	5.0	3.5
7	12.0	4.6	3.2
8	11.5	4.1	2.7
9	10.6	3.5	2.5
10	10.1	3.1	2.1
11	3.1	1.8	1.4
12	2.3	1.4	1.1
13	1.7	0.9	0.8
14	1.6	0.8	0.7
Minerals	1.5	0.7	0.6

Not all railways follow the Rhodesian practice of strict compliance with a tariff book for all rail users. In Britain, for instance, there is what is known as a selective rating system whereby the Railways cannot charge more than the published maxima but can and frequently do charge less. On balance

3 Report of the Commission of Enquiry into the Rating Structure of the Rhodesia Railways, 1959, page 7.

and despite its imperfections there seems to be merit in a system in which every user knows that he is being treated the same as all others.

One minor feature of the Rhodesia Railways tariff which is of interest at the moment is that it is quoted in decimals of a shilling and there is a simple table to convert decimals into pence.

REVENUE

Since the booming construction era which ended about the turn of the century, railways generally have not been markedly successful from a financial point of view. The reasons for this have been many and include excessive land acquisition costs, over-optimism of promoters, gullibility of the public, over capitalisation, duplication of routes, road competition, and state regulation of tariffs. In 1937 nearly a third of the total railway mileage in the U.S.A. was in trusteeship or receivership and in many countries it was the simple fact of bankruptcy which compelled the State to take over the assets and liabilities. The Rhodesia Railways by contrast have been relatively prosperous until recently. It is a new factor, the diversion—for political reasons—of profitable traffics to other routes, which has put them in the red.

Copper is a fairly high rated traffic and in 1965/66 the 1.1 million tons which was moved by rail produced a revenue for the Rhodesia Railways of £10 million. The shifting of any of this traffic to other routes will clearly have an important effect on railway finances since costs are unlikely to move downwards and are more likely to increase because of the increased movements of other commodities due to agricultural diversification policies. Some 4.6 million tons of low rated minerals were moved and produced a revenue of only £3.2 million. Coal and coke which move at the lowest tariff produced £3.7 million for a movement of 3.4 million tons. General Goods, which includes many high rated items, was the biggest earner producing £18.6 million for 6.7 million tons. Revenue from passengers amounted to only £2.2 million.

The pattern of revenue in Rhodesia is quite different from that of Britain and reflects differences in urbanisation, industrial activity and road competition policies. In Rhodesia only a twentieth of total revenue comes from passengers compared with a third in Britain. In Rhodesia, General Goods (including copper ingots) accounts for three quarters of total revenue compared with only a third in Britain. But they both earn roughly the same proportion from minerals including coal and coke.

The Rhodesia Railways operate at an exceptionally high load factor. Each route mile of track carried no less than 2.2 million ton-miles of goods in 1965/66, a figure which few railways outside the big mineral carriers in America can emulate. Passenger density is also high because over four-fifths

of the travellers are Fourth Class. By comparison with older countries there are few branch lines and stations while distances are relatively great. The typical Rhodesia Railways truck is a 40 tonner compared with a 12 tonner in Britain. For these reasons costs and therefore revenue per net ton-mile are low, averaging about 1.5d. in 1965/66. The average haul in that year was 370 miles so that, by reference to the table given above, it can be said very broadly that Tariffs Nos. 1 to 10 are profitable to the railways and the lower tariffs are unprofitable.

ROAD-RAIL COMPETITION

Before the advent of the motor vehicle the railways were the great developers of unexploited regions. In the older countries they pushed out branch lines to every village and hamlet and in the new countries they pushed out main lines to any area which offered even a small chance of development. In Britain the main casualty of this vigorous expansion was the canal system but few people felt much sympathy for its plight and this valuable asset gradually became more and more silted up and overgrown. More recently airlines have taken traffic from railways particularly in the bigger countries such as the U.S.A. Airline competition for passengers has been keen and has rarely been subject to control. The railways have generally accepted the full force of competition from airlines largely because it has in the main been confined to passengers.

But the same considerations do not apply to road-rail competition and it is still a lively issue in many countries. In Britain and the U.S.A. it is probably fair to say that railways have given up the attempt to stifle competition and are actively attempting to meet it by concentrating on those transport services in which they are most efficient. Many people were advocating such policies before World War II. Mr. F. Smith,[4] the Transport Chief of Unilever, was typical of this new school. He said there was no need for special protection if railways would eliminate uneconomic loading by cutting out small stations and branch lines and concentrate on fast goods trains between main centres fed by lorries. He said the number of goods trains could be cut by two thirds and coaches by a quarter.

After the war a modernisation plan for British Railways was introduced to improve competitive ability and—it was hoped— to reduce losses. This involved a whole gamut of developments, including electrification, decentralised traffic management, new tariffs, diesel shunters, double headed diesel electric locomotives with only one man in the cab, vacuum brakes, road-rail containers, new types of wagons, reduction in the number of small wagons, office mechanisation, centralised traffic control systems, colour light signals,

4 Brigadier Sir H. O. Mance, The Road and Rail Transport problem. Pitman 1941, pages 141–3.

long welded rails, concrete sleepers, higher speeds, quicker turnrounds, hump back marshalling yards, automatic couplers, hydraulic brakes, road-railers (for use on both road and rail), collapsible containers, air slides for loading bulk commodities and a general reduction in the system mileage.

But these measures were not enough to avoid further financial deterioration and by 1961 the annual operating loss before meeting any capital charges had risen to £87 million. In the words of the British Railways Board,[5] "the burdening of good traffics with costs arising from bad ones has led to the transfer to road of a considerable volume of traffic which railways are better able to handle, in order to preserve on rail, traffics which could be handled better by road". It was shown that one third of the route mileage carried only 1% of freight and passengers. The least used half of all stations produced revenue which did not even cover station costs without any contribution to operating costs, let alone to overheads. Most rural trains carried less than a bus load of passengers and lost twice as much as they collected in fares.

No immediate answer to the problem was seen other than to press on with modernisation and to cut out uneconomic lines, stations and services. It was out of tune with the times to think of protection against road competition, yet an outside observer cannot help wondering why this should have been so. The appalling over-crowding of the roads with their huge toll of life and limb is in stark contrast to the safety and economy which railways offer their users.

Basically, the whole problem of road-rail competition comes down to the simple fact of railway tariffs and the "what the traffic can bear" principle. If half the traffic is carried at rates above average cost in order to subsidise the other half, and if competition is not regulated, then railways must lose some if not most of the top half to road transport. As road standards improve and lorries get bigger so this process must accelerate.

South Africa has followed a different policy and her railways are almost solidly protected against road competition.

In Rhodesia the position briefly is that anyone can carry his own goods in his own vehicle but a permit from the Road Services Board is needed to carry for hire or reward. Permits for routes which do not interest the railways are issued after hearing objections and are very much easier to obtain than permits for routes which are in direct competition with rail routes.

The Harragin Commission received conflicting evidence of the extent

5 The Reshaping of British Railways, London, HMSO, 1963 (The "Beeching" Report), page 4.

to which road operators had taken traffic which the railways believed they should carry. The Commission accepted, however, that the extent was material in "the higher classes of merchandise upon which the railway, under its rating principles, depends to make up any deficiency in contributions to total cost from other traffics unable to bear the full burden".[6] The Commission made no recommendations beyond urging the Railways and road operators to reach an agreement, which was in fact eventually achieved on certain routes. It did, however, express its convictions that road transport, if left to its own devices, would tend to settle down in the main traffic stream where prospects of profitable operations are brighter and leave to the railways the low grade and irregular and marginal traffics. The Commission believed that there should be some form of stabilisation of public road haulage and that this would induce the road haulier to gravitate to the shorter hauls where his costs are lower than the railways mainly because his terminal costs are small.

To sum up, the position in Rhodesia is that a policy of limited protection is followed. This cannot be said to be a fully worked out programme of road/rail co-ordination but it has enabled the traditional rating policies to be pursued and avoided the expensive modernisation and shut down of services experienced elsewhere. It is worthy of note that there has been one instance of statutory protection, namely in the Mbizi—Nandi Rail Project (Road Vehicle Control) Act, 1966, which virtually prohibits public road haulage in the area served by this branch line in the Lowveld.

CONCLUSIONS

To earn an average return on capital invested in railways, the profit element in sales ought to be higher than it is in most other industries. As long as investors can see the prospect of a satisfactory return on their investment the railways will not be short of capital, but when this prospect disappears the sources of finance dry up quickly. Whenever railway profits have been depressed for any reason—inefficient management, severe competition, Government regulation of tariffs etc.—it has frequently happened that the State has had to step in and assume ownership. State ownership does not change the economic problems of the railways. It merely shifts them on to the shoulders of another group of people—a group who are usually more sensitive to pressure from major consumers of rail facilities than are private investors and boards of directors. The risk then is that the tariff structure will be ossified while the general price level—including most railways costs—creeps steadily upwards.

When tariffs are below the economically justified level the demand for

6 Ibid, page 41.

railway faciliities increases, with the result that still greater sums are required for development. The end result can be that an excessive proportion of the nation's capital is invested in railways whilst revenue continually fails to meet expenditure. This unfortunate state of affairs has arisen in many countries and the vicious spiral of uneconomic rates, mounting deficits and exorbitant capital demands, is hard to break.

Because of conservative financial policies—particularly the inclusion in costs of both depreciation and loan amortisation—the Rhodesia Railways had massive reserves amounting to nearly £30 million at June, 1966. Since then the diversion of profitable traffics and the substitution of unprofitable traffics must have eroded a fair slice of these reserves.

Under normal conditions the stresses and strains experienced by railways in more developed countries, and due largely to competition, would have materialised over decades in this country. Now, and for different reasons, they are upon us, and it will be necessary to consider bold and constructive steps to meet the new situation.

Salisbury,